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NOTES ON CLIMATOLOGY.

BY

ROBERT DeC. WARD.

NEW SOUTH WALES RAINFALL.—The annual volume on the rainfall of New South Wales for 1899 (*Results of Rain, River, and Evaporation Observations made in New South Wales during 1899*), recently issued, emphasizes the fact that 1899 was the fifth successive year with a deficiency of rainfall. The first year of the dry period, 1895, had a shortage of rain of 21%; 1896 of 12%; 1897 of 20%; 1898 of 20%, and 1899 of 21%. The first year of the drought followed six years with abundance of rain, and that year was one of very great losses because of the over-supply of stock that had accumulated during the preceding years of abundance. An important feature of the rainfall of 1899 was the "patchy" character of the rainfall—*i.e.*, its coming chiefly from thunderstorms, and covering very small areas. These are most unsatisfactory rains. They benefit only small fractions of the country, although some of the storms are very heavy. The six "good" years, 1889 to 1894, inclusive, had an average of 28.61 ins. of rain, and the five "bad" ones, 1895 to 1899, had an average of 20.49 ins., the rainfall of the "bad" years being 28% below that of the "good" ones.

Mr. H. C. Russell, the Government Astronomer, discusses the *Recurrence of Rain* in New South Wales in a paper recently read before the Royal Society of New South Wales. The rainfall of a number of inland stations, when plotted, shows clearly a recurrence in cycles of 19 years. The year 1895 is seen to be the first of a series of years with deficient rainfall. From 1895 to the end of 1900, 25,000,000 sheep have died of starvation, in addition to the death of all the increase during the six years, which, in good years, would have amounted to about 20,000,000 more. A diagram of the moon's declination is drawn for purposes of comparison, the extreme south position of the moon for each year being selected as a convenient way of showing the motion in declination. When all the points of the moon's declination are joined by a curve there is seen to be a close resemblance between this curve and that of the rainfall. It appears that during the southerly motion of the moon for six years there is abundance of rain. The drought begins, not wholly for want of rain, but in many cases because of the prevalence of strong north to northwest hot winds, which do not appear when there is plenty of rain.

Mr. Russell does not say that he has "demonstrated that the moon is an active point in the weather," but he thinks that, "seeing the rain is shown so clearly to come in times of abundance, when the moon is in certain degrees of her motion south, and when the moon begins to go north, then droughty conditions prevail for seven or eight years—a phenomenon repeated for three periods of 19 years each—it is either a marvellous coincidence or there is a law connecting the two phenomena." He himself is convinced that there is some connection between the two.

THE LAST WORD ON "HAIL-SHOOTING."—The hail-shooting campaign in southern Europe has already attracted so much interest that up to this time four Congresses have been held to discuss subjects in connection with this undertaking. These Congresses were composed chiefly of persons already strongly prejudiced in favour of hail-shooting. In order that an impartial study might be made of this matter, the Austrian Minister of Agriculture called a meeting of about seventy experts, mostly physicists from various European nations. This committee met at Graz in July last, and, by a large majority, declared that in the light of the results thus far attained, the efficacy of "hail-shooting" seems more and more doubtful. Most of the experts did not hesitate to say that any success is purely imaginary. Nevertheless, it was thought that it might be well to continue the experiments a few years longer.

METEOROLOGY OF THE EQUATOR.—Dr. Hann has lately published an important study of the meteorology of the equator, based on observations made at the Pará Museum by Dr. E. Goeldi, the director (*Sitzungsberichte Wien. Akad. Wiss., math.-naturw. Clas., CXI, Abth. IIa, May, 1902*). By reason of the paucity of meteorological observations from near the equator, the Pará data are of great interest. The observations discussed by Dr. Hann are those from August, 1895, to August, 1901. The temperatures are extraordinarily uniform. The mean diurnal range of temperature for the year is 8.8° C., and the range of the monthly mean temperatures is only 1.4° C. Dr. Hann finds that the monthly mean temperature of Pará is shown to be about 2° too high on the *Challenger* charts. The mean temperature is almost constant from May to September; the lowest temperature comes at the beginning of the year, and the highest at the end. The mean annual relative humidity is 88%, and it is about the same throughout the year. There is a single rainy season, from January to April, and a single long, relatively dry season, from May to December, but rain falls frequently during the dry season. Rain falls almost exclusively in the afternoon and evening from thunderstorms. The annual distribution of rain is abnormal for the equator; the second rainy season, when the sun passes the zenith the second time, is lacking. The thunderstorms usually occur early in the afternoon, but they show a decided tendency to begin at a later hour as the year advances. The wind is prevailingly east and southeast during the dry season, and more northerly during the rainy season. Calms are almost twice as frequent during the latter season.

RELATIVE HUMIDITY IN HOUSES IN WINTER.—Some observations of the relative humidity in furnace-heated houses in winter, along lines similar to those referred to in this BULLETIN for October last, pages 333–334, have been made by Mr. G. A. Loveland, of the United States Weather Bureau at Lincoln, Neb. In the steam-heated office of the Weather Bureau at Lincoln, during February, 1900, the mean relative humidity was 15%, with an outside air temperature of 19.2°. In December, 1899, and January, 1900, the relative humidities were 18.6% and 21% respectively. The temperature of the room averaged slightly below 70°, and the relative humidity of the air outside averaged 76.2%.

Mr. Loveland also made some observations as to the value of evaporating pans in furnaces or registers as a means of increasing the relative humidity indoors. He found that a pan evaporating 2 quarts daily is of little or no use in moistening the air. With pans of water in four registers, in a furnace-heated house, and an average evaporation of 5.9 quarts daily, there was an increase of 2.4% in relative humidity.

BIBLIOGRAPHY OF METEOROLOGY.—A useful working bibliography of meteorology is given in the August number (dated Nov. 10) of the *Monthly Weather Review* of the United States Weather Bureau The list is designed for teachers and students of "elementary meteorology," as is stated in the prefatory note by the compiler, Dr. W. F. R. Phillips, in charge of the Library of the Weather Bureau. The list is, on the whole, an excellent one, but there are numerous works of older dates which it would have been well to omit. The list as it stands is too long, and too discouraging, for a teacher or student of elementary meteorology.